DATA PROCESSING DIGEST

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Systems Design

TABSOL—A FUNDAMENTAL CONCEPT FOR SYSTEMS-ORIENTED LANGUAGES

T. F. Kavanagh, General Electric Co., New York City
*Proceedings, Eastern Joint Computer Conference, December 1960**

TABSOL is a tabular systems-oriented language developed by General Electric to describe "complicated, multi-variable, multi-result decision systems." The system is based on the formulation of "decision structure tables," consisting of "a rectangular array of terms, or blocks, which is further subdivided into four quadrants ((see figure below)). The vertical double line separates the decision logic on the left from the result functions or actions which appear on the right. The horizontal double line separates the structure table column headings or parameters above from the table values recorded in the horizontal rows below. Thus, the upper left quadrant becomes decision logic column headings, and is used to record, on a one per column basis, the names of the parameters affecting the decisions. The lower left quadrant records test values on a one per row basis, which the decision parameter identified in the column heading may have in a given problem situation. The upper right hand quadrant records the names of result functions or actions to be performed as a result of making the decision, once again on a one per column basis. Similarly the lower right quadrant shows the specific result values which pertain, directly opposite the appropriate set of decision parameter values. Thus, one horizontal row completely and independently describes all the values for one decision situation." There is no limit to the number of columns or blocks a decision structure table may have. If a table leads to another problem, the last column may be used as a director to the appropriate next structure table. The system lends itself well to automatic construction of the tables by a computer system. "The first structure tables are usually difficult to write, because most of us do not, as a general rule, probe deeply into the logic supporting our decisions. However, once this mental

*((See DPD, this issue, page 8 .))

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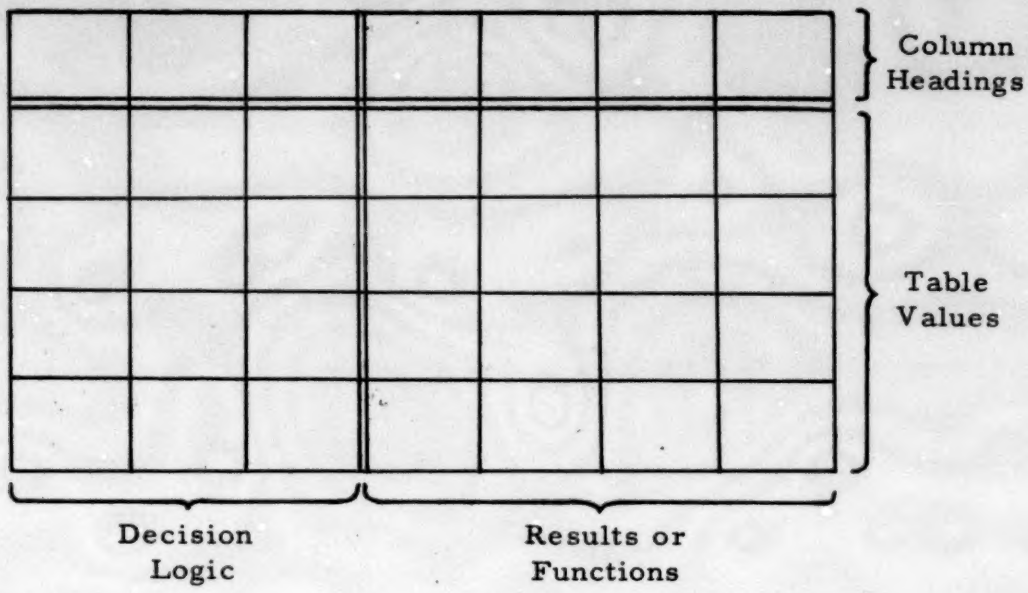
Expandable tables describe the system

obstacle is overcome, 'structuring' facility develops rapidly." ((The TABSOL method is being investigated by the CODASYL group as a universal systems language for computers.))



NEW SYSTEM INTEGRATES SHELL OIL MANAGEMENT DATA

J. W. Haslett and Paul A. Kalb, Shell Oil Company, New York
MANAGEMENT AND BUSINESS AUTOMATION, December 1960; pages 30-34

Shell Oil's plans for a completely integrated management information system are based on the installation of small-scale computers at Shell plant locations to handle all clerical operations. The computer chosen for this purpose is the Monrobot XI. A single machine program has been devised to handle all types of transactions relating to product movements that might occur in a bulk depot, terminal or refinery, including preparation of shipping papers, invoices, receiving reports, stock replenishments and "own" consumption documents.

All transactions are processed in a like manner, and all types of transactions and summary reports are recorded on a single, multi-purpose form. The computer is programed to recognize, sequentially, a system of codes in the master tapes and to modify and process the data to fit the needs of the transaction being recorded. Transactions are processed in random order as they occur during the day's operation, and all are treated alike with one machine program, giving a 1-fold increase to job processing volume.

((The article does not make clear how the locally processed information is forwarded and then used first by Division Accounting Offices, and then by the headquarters in New York.))

REDUCING HUMAN ERROR IN ADP SYSTEMS

John B. Teeple, Thompson Ramo Wooldridge, Inc.
DATAMATION, November-December 1960; pages 91-94

A good environment may cut down human error

"The human being in an automatic data processing system is an important source of error.... Including the man in the design of the system will provide a more effective system for the money than either design without considering his limitations or 'complete' automation." A system which is designed without considering the human limitations of the senses, fatigue and emotional stresses, and physical discomfort, will be subject to human error in any of the following categories: 1) error made and recognized by man before it affects the system; 2) errors made by man which are recognized by the system; 3) errors made by man and not recognized by the system, resulting in incorrect outputs.

Some solutions to the problem of eliminating human error:

1. Provide a sufficient number of operators so that extreme fatigue will not result.

2. Adjust length of on/off time so that fatigue resulting from continuous work is minimized.

3. Design the operating environment with adequate ventilation and temperature control.

4. Provide adequate workspace and seating so excess fatigue does not result from discomfort.

5. Provide for control and display locations, separations, and labeling to facilitate correct input and output information.

6. Insure good reception for voice communication.

7. Provide sufficient lighting to insure readability of visual displays.

8. Assure design of display materials to facilitate accuracy of interpretation.

General Information

A LAWYER'S GUIDE THROUGH THE COMPUTER MAZE

Roy N. Freed, Philadelphia, Pa.
THE PRACTICAL LAWYER, November 1960; pages 15-45

The legal implications of the use of computers is discussed in four areas: problems arising from efforts to use evidence in the data recorded for an EDP system; legal ramifications of the use of computers in areas other than law practice; preventive law for clients contemplating the use of an EDP system; and significant consequences of the use of computers by governmental agencies.

Tape records should prove to be admissible evidence

The area of court admission of evidence in the form of EDP output is one which is not often discussed. It is believed that "as long as the cards, tape, or discs are used in the regular course of business, the same assurance of trustworthiness is present as if the underlying records themselves were relied upon.... In relying upon data processed by a machine, there should be no more necessity for oral testimony concerning the reliability of the machine operations than that of the manual procedure supplanted.... However, if a court is unsatisfied, the machine program can be described to support the validity of the end product, and a computer consultant or qualified machine operator could furnish evidence to allay fears of any errors introduced by the internal processing." The requirements of the "best evidence" may be satisfied by the documents created by computers.

Computers may be used to compile evidence

"Interesting evidentiary situations might arise involving the use of computer determinations," for example, in a medical diagnosis malpractice suit, where a computer may have been used to assist in the diagnosis. The lawyer should be sufficiently familiar with EDP systems to anticipate the type of records that might be available and desirable. If he needs copies of records, he may be able to use service bureau facilities to prepare what he needs from the available tapes or cards of the EDP system in question. "In many cases where analyses and tabulations of great quantities of data will be offered in evidence, resort to a computer can be extremely helpful.... The use of a computer to facilitate the preparation of the evidentiary end product should detract in no way from its admissibility.... As a matter of fact, where the machine has been exploited properly, use of a computer actually may enhance the probative value of the evidence because of its qualities of accuracy and infallibility superior to humans."

It is conceivable that there will arise cases of legal liability from failure to utilize a computer, with such a neglect constituting a breach of the obligation to exercise reasonable care. An example might be the lack of responsibility of a corporation to its stockholders because it did not successfully compete with competitors who were using computers for better management of their companies. Such

Someone may be sued for not using EDP

situations can become quite troublesome to a lawyer "since they are almost universally fact questions for jury decision, without the assistance of expert testimony specifically directed to the issue of reasonableness. For some time to come, the extent of and experience with computer use for a particular purpose may be so unknown to the ordinary juryman that he is unqualified to pass judgment, relying solely on his own knowledge, on the due care involved either in a use or failure to use. Such cases, it would seem to be entirely in order to produce through an expert evidence concerning the results obtainable from such devices and, possibly, their utilization by others."

"A variety of human reactions toward computers must be taken into account in selecting veniremen for a jury." Also, "in trying to convince a jury that the design of a machine control system satisfied the demands of reasonable care, it may be necessary to furnish a fairly detailed description of the mechanism, until general familiarity with and confidence in such devices increases."

THE MANAGER AND THE BLACK BOX

Melvin Anshen
HARVARD BUSINESS REVIEW, November-December 1960; pages 85-92

Management is still an art

It is believed by the writer of the article that the extent of the changes in management resulting from the use of computers in decision-making has been exaggerated. Different types of decisions are described along with the potentials and limitations of computer support. The types of decisions described are:

1. Setting the agenda. "Finding the problems that need to be solved and assigning priorities to them are the activities most completely characteristic of management in business organizations."

2. Goal choices. This is "the selection of specific targets for a business as a whole or for its subordinate parts."

3. Resource allocation. This includes two subclasses: routine, repetitive decisions; and unusual decisions.

4. Implementation. For all the other types of decisions there is the problem of how to put them into operation.

5. Making evaluations. How to appraise results, decisions on continuing previously determined courses, and how to initiate amended or new activities.

The forecast that "the structure of business organizations and the jobs of managers will see revolutionary changes" is believed by the author to be "open to challenge on two principal grounds. First, the managerial function is too complex and thoroughly diversified to be programed all up and down the line." Second, "there has been relatively little study of the system after its installation.... Company problems that are assessed in information-processing terms are complicated by other factors, such as individual and group motivations and pressures."

Resource allocation best uses the new techniques

The author believes that "the best immediate opportunities for using mathematical techniques are in problems of resource allocation.... Process, batch, and item scheduling in production; inventory, shipment, and transportation scheduling in distribution; capital budgeting in finance --these and other problems all possess certain characteristics that make them unusually susceptible to solution by existing mathematical techniques."

The other decision classes are unstructured to varying degrees, and in these areas "the new technology can only proceed haltingly." Other limitations on the adaptability of the new techniques include the following:

1. "Progress for the firm as a whole does not guarantee easy acceptance by managers who live within a system of rewards and penalties that uniquely depend on their positions in the organizational structure." Also, "the factor of resistance to change [may show up in] a subtle withdrawal of support. This alone would certainly delay and attenuate the drastic changes in management's status and significance that may be threatened by mechanized decision making."

Who decides what to decide?

2. "Who shall lead the boxes?" Since the decision responsibility inlcudes "deciding what to decide," and the execution of the decision, the "black boxes... operate at a disadvantage [even in problem areas where they are ideally suited]. Not only must they remain on sufferance... but they cannot tell management what they should be doing, nor can they organize people to carry out the 'decisions' they make."

3. "Finally, there is a significant word to be said about the morale of the managers themselves and its relation a) to their capacity to handle their assignments effectively; b) to the whole problem of the education, the recruitment, and the early progress of the management generations of the future.... Extravagant predictions about the erosion of traditional responsibilities in certain management levels can have a devastating effect on the willingness of today's managers to commit their abilities and their loyalties." Moreover, "extremist views can seriously impede the flow of youthful brains and directed energy that constitute the resource most scarce and essential for the future of our society."

The more conservative and precise definition of computer usefulness in decision-making should make it easier for management to make a smoother transition to "the new management environment, and reduce the kind of overcommitment of investment... that threatens

to be a difficult course to justify." Used with care, the new "decision technology" can relieve management of "that part of his assignment which makes the smallest demands on management talent, but claims the largest, most immediate share of management attention." Managers will then have time "to work on the unstructured decisions that often are not completely handled. In addition, they will have time to look for opportunities to deal more effectively with the truly creative aspects of their work: discovering problems in advance of crises, deciding what to decide, and then executing decisions through complex human organizations.

Unstructured problems need human talents

"What this means is that the job of middle management need not wither away, as some have predicted, but rather that its content will be changed and, in certain dimensions, increased in importance. For top management, it means that the total performance of lower organization levels will be improved by integrating the new decision technology into daily thinking and operations.... The phases of management performance with which many are most dissatisfied today--the creative activities of problem identification and decision execution --will show significant improvement."

MANAGEMENT CONTROL SYSTEMS

Edited by Donald G. Malcolm and Alan J. Rowe, Systems Development Corporation, Santa Monica, California
Published by John Wiley & Sons, Inc., New York, 1960. $7.25

In July 1959, System Development Corporation held a symposium on Management Information and Control Systems to explore the present state of the art. The purpose was to provide the necessary background for a program of research in the designing of management controls of a total system, dedicated to the public interest. The background papers comprising the sumposium, which are gathered together in this book, are in five sections:

1. Concepts of management control and present practices in both business and the military departments.

2. The impact of computers on the design of management controls.

3. Examples of automated management controls, illustrating the approach and the kind of results achieved in well-thought-out and advanced programs in business.

4. New approaches, touching on the future possibilities in management control and information systems.

5. The need for research in management control system design, and description of the program presently underway at System Development.

Participants in the Symposium were drawn from many sources of concern in management control, including those actively working in the research and design end of computer use, those in industry who are engaged in designing and operating management information systems, and educators who have been prominent in working on management information problems.

PROCEEDINGS OF THE EASTERN JOINT COMPUTER CONFERENCE, DECEMBER 1960

With what seems to us a long overdue display of common sense, the planning committee for the Eastern Joint Computer Conference had all of the selected papers pre-printed in one volume before the conference. This is helpful, not only to reviewers, but to those persons who could not attend and who would like to know what, of significance, was said before the following year's conference has come and gone. Two of the papers were selected as co-winners in the competition, which was an innovation of this year's conference. These are reviewed below and on page 1. For a copy of the proceedings ($3.00), write to any one of the cooperating societies: Institute of Radio Engineers, 1 East 79th Street, New York 21; American Institute of Electrical Engineers, 33 West 39th Street, New York 18, Association for Computing Machinery, 14 East 69th Street, New York 21.

A LOGICAL MACHINE FOR MEASURING PROBLEM SOLVING ABILITY

Charles R. Langmuir, The Psychological Corporation
*Proceedings, Eastern Joint Computer Conference, December 1960**

Because of the vast costs incurred in selecting and training programers and others connected with a computer installation, the method by which personnel are selected is crucial. The author's organization has developed a testing device called LAD (Logical Analysis Device) which may be used to test an individual's problem solving abilities. The device is exceedingly simple. A display panel contains a light surrounded by nine buttons. The buttons and the light are connected with arrows in an array which presents a logical problem to the operator. He must determine which combination of buttons must be pressed in order to turn on the light. Complications arise from the fact that some of the buttons are preventors, and some combinations of arrows may not result in the action they may indicate at first glance. The evaluator may increase the complexity of the logical problem if the operator solves the simpler problems quite readily.

* ((See preceding digest.))

The operator's actions in solving the problem are recorded on a tape connected with the device, and this evidence, combined with the notes he makes during his problem solving, is used to score the results in a 15 point scale. This scale has been tested extensively, and has been found to be extremely efficient. Moreover, experiments show that "behavior exhibited by an operator's work with LAD exercises is an expression of stable, individual, personal characteristics and that these characteristics which can be observed systematically in the LAD procedure will also be characteristic elements in the individual's working environment."

MILWAUKEE TRAINS ITS COMPUTER STAFF

RAILWAY AGE, December 12, 1960; pages 28, 34

The Milwaukee Road will install an IBM 7070 in the Chicago office early in 1961. The computer will be used in four application areas: Freight revenue accounting, car accounting, stores accounting, and payroll accounting. Each of these areas covers related functions integrated by the use of the same basic inputs. Nine regional data centers will be tied into the system.

Personnel for the system were recruited from the entire company through publicity carried in the employee magazine plus recommendations from supervisors. Aptitude tests were given as close as possible to the employee's residence--a policy which caused some difficulty in areas such as Montana, Idaho and the Dakotas where suitable testing centers were scarce. An abundance of candidates, however, was available. Out of the first 225 applicants 13 were selected for programing school, of whom four were placed on the conversion staff. The second class produced three more. A total of 550 employees took the aptitude test, with 41 selected for programing school. Of these, 21 completed the course and were assigned to the conversion staff. The Milwaukee feels its staff-building program will help to take care of other manpower needs in the future.

INSTALLATION TECHNIQUES FOR ELECTRONIC SYSTEMS

Virgil F. Blank, Haskins & Sells, San Francisco, California
THE CONTROLLER, December 1960; pages 576-578

An example of the feasibility study phase of an EDP system is described in detail, with the system design and installation phases covered more briefly. The feasibility study is divided into the fact-finding, analysis, and implementation stages. The fact-finding stage consists of manual clerical cost survey and the mechanized cost survey.

Use machine accounting techniques to design the EDP system

To study the clerical areas, give each clerical employee a form on which he describes his duties in terms such as sorting, classifying, filing, computing, along with an estimate of the percentage of time devoted to each process in a certain time period. Samples of completed forms used in the task should be attached. Annual salaries including fringe benefits should be obtained. All this information may then be coded and punched on cards for analysis by mechanical means. A flow chart of each function should also be made. A similar survey of the mechanized functions should be made, and the findings coded for analysis by machine processing.

When all the detailed findings have been assembled, the feasibility committee must use its judgment to select those functions which might be subject to integration, or functions where problems exist because of system limitations, or functions where mechanization may be substituted for intuition. Each function must be examined in its entirety. For example, the sales order processing function would include receipt of the customer's order, shipping order, invoice, inventory control, accounts receivable, and accounting. Where an area of a function shows possibilities for mechanization, the cost of the clerical and punched-card processes within that area are considered in relation to the cost to mechanize that portion on EDP. A summarization of all the findings will indicate whether or not the study should proceed.

Systems costing data

In development of a system design, the most critical area is the cost estimate. Besides the obvious costs of equipment and personnel, there are:

Preliminary system study
Detailed system study
Training programers
Programing each proposed application
Preparing physical facilities
Training operators and technicians
Indoctrinating executives, supervisors and workers affected by the computer installation
Providing spare units of equipment
Operating supplies such as tape, cards, forms, etc.
Conversion of data before start of the system
Setting up and test-checking the program
Parallel operation during changeover
Learning period during the new system.

Cost should not be the only benefit to be considered in evaluating the proposed system, as it is quite likely that the electronic system will be more expensive than the punched card or manual system. All the anticipated benefits to management should be summarized. The report to management should be written carefully and in detail, beginning with a section giving the reason for the study, the scope of the investigation, and the recommendation. After a detailed description of the areas of study and the proposed new system for each application, a time schedule, summary of costs, and plan for action should be given.

SMALL COMPUTERS IN A LARGE COMPUTER ENVIRONMENT

Frank Cole, Douglas Aircraft Co.
DATAMATION, November-December, 1960; pages 87, 88

The computer philosophy of the Douglas Missiles & Space Systems Engineering Department is:

"First...organize a professional programming group which can accept an engineer's problem statement, program the problem on large scale equipment, and get good answers out fast. Second, provide suitable general purpose abstractions which can be programmed by the engineer for processing on large scale equipment. And, third, select smaller computing systems for direct access programming and operating by the engineer."

The reasons for providing small direct access computers in an engineering organization:

1. Immediate access for small problems requiring rapid service.

2. Since the small machine is no more expensive per hour than the engineer, halting the machine and on-line monitoring are permissible, and this may be important at times.

3. There is often legitimate reason for keeping certain design problems at the finger tips of the engineer, and this may very well include the computing phase of the problem.

HOW WE PRINT OUR OWN CHECKS IN MAGNETIC INK

James C. Dycus, Oak Cliff Bank and Trust Co., Dallas, Texas
BANKING, December 1960; pages 114, 115

The Oak Cliff Bank prints its own MICR checks and deposit slips on its own A. B. Dick Model 366 offset press, at the rate of 350 check orders per day. The checks are printed 5-up, and additional forms printed at the same time are mailing labels for mailing the customer's checks, and two wallet-size identification cards. Paper offset masters are prepared on an automatic typewriter activated by edge-punched cards which also serve as a permanent file for re-orders. The bank has found it can keep to the ABA specifications without difficulty, even though the printer's operator had had a minimum of experience when she began printing the magnetic ink characters. The free 4-day check service has been instrumental in attracting many new customers to the bank.

LOADS GET HEFTY AS BANKING GOES MECHANICAL

ENGINEERING NEWS-RECORD, December 8, 1960; pages 42, 43

The new Bank of America building in San Francisco will house the bank's electronic data processing center. The building will contain the largest installation of infinite-access flooring, 129,000 square feet. The one-foot space between the slab and plywood flooring will be used as a return air plenum. The weight of the electronic equipment and the need for wide column spacing for flexibility of floor space required a specially designed column, using heavy steel and 6000-psi concrete.

WHY COMPUTERS TAKE UP GAMES

BUSINESS WEEK, November 26, 1960; pages 137-144

"Game playing" is not always just a "fun" exercise for computer scientists. Some of the games may pay off in programing innovations that will make computers easier and cheaper to use. Examples of some of these useful games are given.

Applications

ATLANTIC CITY'S EDP "SHOWCASE FOR SERVICE"

Robert W. Hogg, Atlantic City Electric Co.
MANAGEMENT AND BUSINESS AUTOMATION, December 1960; pages 24-28

The Atlantic City Electric Company has been operating its "showcase" EDP center since last July. The RCA 501 system uses paper tape input and automatic re-entry through optical scanning to produce 12,000 ready-to-mail postcard size customer bills daily. The 90-column cards of the previous system were converted to 80-column cards then to magnetic tape in 501 code at the RCA Wall Street Data Center with a high degree of accuracy.

A paper tape containing account numbers in the same sequence as in the meter book is produced by the computer punch as a by-product of updating the master file. During the file maintenance run, the computer extracts the account numbers of approximately 12,000 customers scheduled for each day's billing cycle. The paper tape with the extracted account numbers in meter book sequence is then fed into a Friden Programmatic Add-Punch machine, which reads the account number and then stops for entry by the operator of the four digits of the meter reading, taken from the meter book.

Utility bills are automatic input-output in computer system

The high speed off-line printer is used for preparing bills from billing information on magnetic tape. The customer's address and billing information are printed side-by-side on a billing form. The bill form is chemically treated so that when it is put through a Moore Business Forms Laminator and Burster machine, the two sides are "sandwiched" together to form a postcard bill ready for mailing.

When bills are returned with payments, the cash stubs are fed to a Farrington IMR Optical Scanning device which scans the stubs at the rate of 100 per minute, and punches the account number and cash amount into paper tape. The IMR simultaneously verifies the account number and amount (sic) by comparing them with check digits and records the cash amount collected in an accumulator, automatically recording the accumulated amount on the paper tape at the end of each batch of stubs. Partial payments and special information may be entered on paper tape through the RCA 501 tapewriter.

The company plans to include stores, payroll and property records accounting and engineering computation over the next year.

DON'T FIGHT EDP—USE IT

B. W. Phillips, Reynolds Metals Co., Richmond, Va.
PURCHASING, December 5, 1960; pages 82, 83

In an EDP system, the purchasing agent can set up the purchasing function so that many types of information may be derived from the purchase order. Examples are:

1. Total dollar expenditures--MRO, capital, etc.
2. Total dollar expenditures--by plant
3. Total dollar expenditures--by category
4. Total dollar expenditures--by category by plant
5. Purchase Order issued per month; per year, etc.
6. Purchase Order issued per category--per month--per plant
7. Total purchases from individual supplier per month or per year
8. Total purchases from each supplier per plant
9. Rate of dollar expenditure vs estimated
10. Requisitions received and processed
11. Requisition on hand--and dollar totals
12. Expenditures by departments--daily, monthly, etc.
13. Total P. O. s processed--by plant--department and category
14. Project Planning--Budgets, price and delivery, history
15. Project Control--Expenditure--scheduling
16. Management reports--detailed or summary.

UNIVAC DATA-PROCESSING SYSTEM AT WORK IN THE CREDIT DEPARTMENT

Published by Remington Rand UNIVAC and N.Y. Credit and Financial Management Association

In order to acquaint its members with the use of EDP in the credit function, the New York Credit and Financial Management Association asked Remington Rand Univac to assist in preparing a pamphlet explaining the new electronic systems. The resulting publication is based upon the experience of a firm which used their New York Data Processing Center as a control for decentralized management among the various plants, warehouses, division headquarters, laboratories and sales offices. A Univac II Data Automation System handles record keeping operations. The Accounts Receivable and Credit Accounting functions of the system are described in the pamphlet. The way in which the reports printed out by the computer are designed to help the credit executive are described in detail. The pamphlet points out that the example used is applicable only to that particular company, and that each credit executive should participate in planning for EDP to assure the proper system design for his own purposes. A copy of the pamphlet may be obtained from Remington Rand Univac, 315 Fourth Avenue, New York 10, New York, or from New York Credit & Financial Management Association, 71 West 23rd Street, New York 10, New York.

Programing and Operation

COMPUTER TAPES AND THEIR CARE

George Cole, The Ramsey Co., Philadelphia, Pa.
DATA PROCESSING (U.S.), November 1960; pages 11-16

Presently used magnetic tape is of three types: steel, acetate or Mylar. Information may be erased or made useless through extremes of heat or cold, excessive relative humidity, de-magnetization, dust, or shock. Acetate tape needs temperatures between 65 and 80 degrees Fahrenheit for correct operation. The range for Mylar and steel is 50 to 90. Mylar tapes used infrequently may be stored for long periods at temperatures ranging from 40 to 120, but they should be conditioned for at least 24 hours with the 50 to 90 degree range before processing. Acetate tape may be stored for as many as four hours outside the recommended temperature range providing the temperature does not exceed 120 degrees. Above this, the tape will curl, warp, or shrink and become permanently damaged. The tape will start to melt at 250 and will support combustion at 400.

The Polystyrene reels usually used produce toxic fumes when burning, and masks must be used by fire fighters. Most steel cabinets used to house tapes do not provide adequate protection. For all practical purposes, up to a certain point, wood cabinets offer greater protection because they are non-conductors of heat. Actually, the only office equipment at present which offers protection to tape is in the form of vault doors or safes tested by the Underwriters Laboratories of the Safe Manufacturers National Association.

Safes are safest

In the event of a fire, it is important that the safe be allowed to cool to room or atmospheric temperature before opening it, to prevent an explosion which will destroy the records or reels which have survived. One of the best safes available measures 60-1/4" x 40-1/2" x 27" and houses about 180 reels of tape, stored in racks. When loaded, this weighs about 4000 pounds in an area about 43" x 32". This requires an adequate load carrying capacity by the elevated floor of the computer room, a point to consider during the room design phase. Figures compiled by the National Fire Protection Association indicate that 4-hour Class-A safes will save 94.6% of the contents, whereas a half-hour safe will protect only 34.7%.

Building requirements for fire protection

Vault storage is a problem to be considered during the design of the building. A ground supported vault is needed if the building is non-fire-resistive. A structure-supported vault may be supported by the framework on any floor if the building is to be fire-resistive. Ceiling and structural members should be of non-flammable or non-combustible material. Electric wires should be heavy enough for the load to be carried, and insulation should be kept from deterioration. Fuses and circuit breakers should be low enough amperage to break the circuit in the event of a fault or overload. The air conditioning system should be equipped with fire dampers. Finally, good housekeeping is a good fire safety measure.

What fights fire best

Although a sprinkler system is not advisable for a computer area, walls adjoining other rooms could be waterfall-cooled in the event of fire, as in one installation. Plans call for a trough between the main floor and the elevated floor for removal of the water. In another installation, a sprinkler system in the computer room is controlled by a manually controlled valve outside so that the system will not be set off accidentally by excessive heat when there is no actual fire. Carbon dioxide will smother flames in burning reel cases, but the cases re-ignite when the Co2 cloud is turned off. Dry powder such as baking soda seems to be effective, though difficult to apply to all areas. A fine spray of water applied under high pressure directly to the fire areas seems to be the most effective method. Self-extinguishing plastic cases for tape are on the market, but the plastic is cloudy and makes the information on the side of reels housed inside difficult to read.

Humidity should be between 40 and 60%, although Mylar can tolerate 20 to 80%. Tapes processed infrequently may stand humidity of from 0 to 80%, but must be conditioned for 24 hours before using.

Fungus growth tends to appear on acetate or Mylar tape when humidity reaches 80% for more than four hours. Demagnetization may happen if tapes are to be transported some distance. Lined shipping cases which give protection are available.

For final protection of tape records, it is advisable to have at least five generations of tapes in remote and close storage.

ANNUAL REVIEW IN AUTOMATIC PROGRAMMING, VOL. I

Edited by Richard Goodman, Brighton Technical College, England
Published by Pergamon Press, New York, 1960. $10.00

Eighteen papers presented to the Conference on Automatic Programming of Digital Computers at Brighton Technical College, April, 1959, are collected in this first volume of an annual review. It is planned to continue both the annual conferences and the resulting review of presented papers on automatic programing, particularly on the state of the art in England. Associate representatives have been chosen from other countries, including U.S. representatives R. W. Bemer of IBM and Dr. Grace Murray Hopper of Remington Rand, to assist the Automatic Programming Information Centre at Brighton in keeping abreast of automatic programing techniques abroad. Both English and American automatic programing systems are included in the present volume. The English programing systems are for Pegasus, Deuce, and Stantec-Zebra. The American Systems are for the IBM 709, Flow-matic and Math-matic (Univac), and TIDE for the IBM 650.

Points of Interest

The new member of the Philco 2000 EDP series, known as Model 212, is a general purpose computer said to be four times faster than others in the line. Four instructions may be processed simultaneously, with asynchronous processing between instructions and within an instruction.

Systems Development Corporation of Santa Monica, California, has created a computer operated teaching system using a Bendix G-15 computer programed to sense a student's needs, respond to his errors, and build his knowledge and confidence quickly and reliably. When the student misses a question the machine "detours" him to a special set of remedial questions. Once his performance on the remedial set is satisfactory he is returned to the mainstream of the course. If necessary, the machine may take the student out of the original series and into other basic series if he requires excessive remedial help. If the student's performance is high enough he can skip whole items in the basic series.

The AN/UYK-1 computer, designed by Ramo-Wooldridge, will be delivered to the Navy. The AN/UYK-1 is a "stored logic" machine which permits the user to select a word length, order structure and instruction repertoire especially suited to the problem at hand. These normally " wired in" characteristics are specified by data stored in the computer's memory and may be changed during the normal loading procedure without hardware modification.

GECOM (for General Compiler) is a new programing technique which automatically translates English language instructions into computer code. The system was developed by General Electric Company's Computer Department. GECOM permits a computer to accept COBOL, ALGOL, and other language-instruction techniques in use. GECOM will be available this spring for the GE 225 general purpose computer, and later on, for all General Electric computers. GE has also developed TABSOL (Tabular Systems Oriented Language), a method for describing the decision-making processes in table, or tabular, form. ((See DPD, this issue, page 1.)) TABSOL was developed by G.E.'s Manufacturing Services, and is the first systems-oriented language for computers. GECOM will also handle TABSOL tables.

Remington Rand Univac has developed the Univac 1107 Thin-Film Memory Computer, with a memory consisting of small squares of thin glass plate on which is a series of metal dots, a few millionths of an inch thick, made by depositing vapors of ferro-magnetic metal. The new memory makes the 1107 rank with the fastest computer system ever developed, at a much lower cost. Also announced is the Univac 490 Real-Time System, and the 1206, a military version of the 490.

RCA and Remington Rand have interchanged programs utilizing plain English between data processing systems. This is the first use of COBOL between the computers of different manufacturers.

Indiana State Police have linked a data processing center in Indianapolis with a State Police microwave relay station to provide communications and data transmission for payroll, logistics, maintenance data, teletype and telephone traffic. The equipment was developed by RCA.

Digitronics Corporation has developed the Dial-o-verter System, which operates in connection with the Bell System's Data-Phone 200 subset for rapid transmission of punched card, paper tape, or magnetic tape over regular toll telephone lines. As many as 27,000 alphanumeric characters can be sent during one three-minute phone call.

Tally Register's Transdata System provides high speed communications by punched tape when coupled with the Bell System Data-Phone 200.

Recording & Statistical Corp. has established a Univac computer center in New York to furnish insurance companies with a centralized, economical facility for electronic data processing. (From BEST'S LIFE NEWS, December 1960; page 82)

Comment

DIRECTION AND CONTROL OF TECHNOLOGICAL CHANGE

Two responsibly written papers which have come to our attention discuss aspects of a social problem that will become increasingly urgent of solution. The problem concerns the direction and control of technological change. The first of these two papers, digested below, suggests the way in which presently available techniques, or potential techniques built upon current developments, could create an automatic information processing system that would completely revamp our concept of personal fiscal responsibility.

The second paper, also digested below, explores the possible consequences of the kind of powerful automation foreseen by the first author, and outlines the steps necessary to control it properly. The centralization of credit control in the fiscal set-up outlined by Mr. Dean is an example of the automation potential that could, in Mr. Wood's opinion, provide a dictator with a tool to overthrow a democratic government. Such a possibility therefore imposes upon scientists and technologists the obligation to work with other professions in channeling technological advancements into areas of greatest benefit to man, consistent with the highest moral principles. We believe there is a parallel here to the development of atomic energy, except that the "destructive" power of automatic information systems is much less apparent, and perhaps therefore, even more insidious.

A VISION OF OUR AUTOMATIC FUTURE

Neal J. Dean, Booz, Allen & Hamilton, Chicago, Illinois
Paper presented at 2nd National Conference on Electronic Computation, American Society of Civil Engineers, Sept. 1960. (1)

Data processing mechanisms and concepts are advancing rapidly. We can extrapolate from current experience to 1980 and project the possibility of replacing our daily business routines and present system of using cash, checks, and money orders with a truly universal and automated "credit card system."

A universal credit card inserted in slots would record most transactions such as retail purchases, parking. All data would be recorded centrally at "financial utilities." Inter-bank transfers would

Universal credit card

be automatic as would the payment of financial transactions, such as mortgages, insurance, loans. Automatic metering of utilities will be possible. "Services could be billed directly... and paid entirely without human intervention until the point of review and passive approval, after the fact, by the consumer."

Income from company payrolls and investments would be automatically credited to an individual's bank account. Some transactions between individuals, such as doctor fees, could be recorded by using coding techniques over the dial phone system.

Such a system "could have important benefits for state and federal government.... The Internal Revenue Service could dispense with most of its investigating agents" since the returns would be automatically prepared from data in your mechanized fund account.

"The above predictions can become practical with only modest improvements in present equipment.... Beyond the equipment, only some advanced concepts of planning and cooperative effort appear to be necessary....[Since] there are laboratory developments which may reduce memory costs by a factor of 100 within five to 10 years... a five to 15-year span should be enough[to make available] at least the elements of our monster equipment system." But the education, long-term planning, and coordination required to develop an inter-company system will require 20 to 30 years at the earliest.

Resistance to change

The principal "human factors" delaying the introduction of systems such as an automatic financial system are: reluctance to change; interest and pride associated with the existing system; need for assurance of economic justification; and uncertainty of placing reliance in new, unfamiliar systems.

The first two factors "are largely offset" by a clear statement of the "benefits" of the new proposal. Competitors' actions may provide an incentive to initiate the introduction of new techniques. Economic justification can often be attained by considering the "value of more timely, complete and pertinent information," and also "the cost of not going ahead."

Management's "uncertainty of relying on information obtained from difficult-to-comprehend systems and equipment" can be overcome by improving the manager's understanding of the techniques and what they can do for him. But the engineer must help "break this technological communications gap."

After the go-ahead for a complex system is given, time becomes a "fifth hurdle"--time for planning, installation and conversion. "In 20 to 30 years we may see banks becoming financial utilities that will automatically record... monetary transactions." Computerized bookkeeping and universal "credit cards" will displace our monetary system. "The human factors... will govern the rate of change from our present systems to new ones. A key factor is the need to bridge the communications gap between the non-technical manager and the... engineer.... This is the true challenge of our 'automatic future.'"

THE SOCIAL RESPONSIBILITY OF ENGINEERS AND SCIENTISTS

F. B. Wood, IBM Corporation, San Jose, California

1959 Proceedings of the Western Joint Computer Conference,
pgs 310-313(2)

Some computer engineers appear to be increasing their awareness of their social responsibilities. This paper presents a straightforward way of determining such responsibilities.

How to evaluate the social consequences beforehand

A specific sequence of actions for analyzing the social responsibilities of engineers and scientists is this:

1. Record the "engineer's special work."
2. Predict "new knowledge and devices" which may result.
3. Speculate on "potential social consequences."
4. "Find expert advice" from specialists in the fields of psychology, biology and medicine, and the social sciences--history, law, philosophy, political science and sociology--as appropriate. It is important for the engineer to recognize when he is out of his field and to call in such expert help.
5. "Take appropriate action: inform, discuss, propose, campaign."

An example: centralized credit control

For example, "Consider an engineer working on the problems of data communication in connecting remote stations to a central computer.... A successful solution to the data communication problem might result in a universal credit system, where every store, airline, doctor's office, stock exchange, etc. would have terminal sets which would make transactions when the customer's coded credit card is inserted in the set. This would eliminate the need for money for most transactions.

"Then we...'List Potential Social Consequences' such as:

1. The elimination of money might mean there would be no more armed robberies....
2. The universal credit system might permit a shorter working week in sales and business administration work, permitting individuals to devote more time to creative hobbies....
3. New problems might arise such as gangsters inventing a new money system to finance illegal activities.
4. Police measures instituted to suppress the underworld gangsters might interfere with groups working on important social problems. For example, some public officials might be violating some of the provisions of the United States Constitution by discriminating against some minority racial or religious group. People in the community involved might feel like contributing a few dollars each to hire a lawyer to look into the case. These people might be afraid to contribute to this important cause when the ac-

counting system would keep a record of each transaction. How do they know whether some future official will be able to distinguish between supporting a legal test case to protect the Constitution, and supporting some subversive activities? In such a situation the existence of this universal accounting system might inhibit people from protecting our constitutional government.

"The next step for the engineer is to find expert advice to evaluate which of the potential social consequences pose real problems." The engineer's informal discussion with these expert advisors would result "in a restatement of the problems as follows:

1. How can we provide protection for individual freedom in a more complex society where new technology such as computer-data communications systems permit a centralized accounting system covering all financial transactions in the community?

A new tool for dictators

2. Are there simple legal means and technical characteristics of a computer-data communication system which permit safeguards to prevent potential dictators from seizing control of the system as a means of gaining control of our country?

"These questions as now restated are questions of importance to all citizens." The engineer can then take action appropriate to the state of development of the idea and the social projects related to it. The engineer can then:

Inform: If there exist projects adequate to study the problem;

Discuss: If social scientists are available and financed (but they need not understand the technology involved);

Propose: If social scientists or funds are inadequate, propose new appropriations, scholarships, or government agencies.

Campaign: If the problem is urgent and funds are not allocated, campaign to get political groups and the people to pick up the problem.

Bring in the other professions

"I do not suggest that the engineer should be responsible for solving the social problems related to his work. The engineer's responsibility is more of a coordinator to alert the people of our country to the status of our coverage of the problems. If the engineer finds that a social problem relating to his engineering work is not being adequately investigated, he has a responsibility to refer questions to management, social scientists, government agencies, and to the citizens at large to stimulate the investigation of such problems."

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In addition to those professions Mr. Wood suggests as being involved in the solution of the problem, we would include professional and lay religious leaders who have the ability to define and express the religious principles upon which our democratic form of government was built. Because ultimately, the problem of the proper use of power is a moral problem, and the moral responsibility of the people will be the deciding factor.

REFERENCES

1. A limited number of copies of the paper are available from the author: Neal J. Dean, Booz, Allen & Hamilton, 135 S. LaSalle Street, Chicago 3, Illinois
2. Proceedings may be obtained from any of the cooperating societies: A.C.M., I.R.E. or A.I.E.E. See DPD this issue, page 8 for addresses.

Training

"Introduction to Digital Computers and Programing," a course offered by University of Southern California, Department of Industrial Engineering

Date: First class begins February 9, 1961
Place: University campus
Content: A general orientation course in computer concepts; for business and professional people beginning a study of EDP
Information: Seymour Porter, Instructor, Department of Industrial Engineering, University of Southern California, Los Angeles, California. Telephone: RI 8-2311, Ext. 469.

Engineering Executive Program, presented by University of California at Los Angeles

Date: Beginning September, 1961
Place: University of California at Los Angeles, California
Fee: $350 for each semester
Requirements: Applicants must meet the acceptance standards of the Graduate Division of UCLA, and must have at least 5 years full time industrial experience.
Deadline: Applications must be submitted by March 1, 1961
The Engineering Executive Program, Dept. of Engineering, Room 4173C Engineering Bldg. Unit I, University of California, Los Angeles 24, California

University of Michigan, College of Engineering Summer Conferences: courses are offered in operations research, management sciences, and advanced data processing. For information, write to R. E. Carroll, 126 West Engineering Building, University of Michigan, Ann Arbor, Michigan.

Meetings

Third Institute on Information Storage and Retrieval
- Date: February 13-16, 1961
- Place: The American University, Washington, D. C.
- Information: Prof. Lowell H. Hattery, Director, Center for Technology and Administration, The American University, 1901 F. Street, N. W., Washington 6, D. C.

American Management Association West Coast General Management Conference and Data Processing Exhibit
- Date: February 22-24, 1961
- Place: Seattle, Washington (Hotel Olympic)
- Information: Gabriel N. Stilian, Mgr. Administrative Services Division, American Management Association, 1515 Broadway, Times Square, New York 36, New York

American Management Association 7th Annual Data Processing Conference and Exhibit
- Date: March 7, 8, 1961
- Place: New York City (Statler-Hilton Hotel)
- Program: Advances in the Data Processing "Production Line" and Management Information Systems
- Information: Gabriel N. Stilian (see above)

IRE International Convention
- Date: March 20-23, 1961
- Place: New York City (Waldorf-Astoria Hotel and New York Coliseum)
- Information: E. K. Gannett, Institute for Radio Engineers, Inc., 1 East 79th Street, New York 21, New York

POOL, Users Group of Royal Precision LGP-30 and RPC-4000
- Date: March 27-30, 1961
- Place: New Orleans, Louisiana (Jung Hotel)

Conference on Systems and Procedures, sponsored by San Francisco Chapter, Systems and Procedures Association and University of California
- Date: April 21, 1961
- Place: San Francisco, California (Mark Hopkins Hotel)
- Information: Robert L. Briggs, 28 Geary Street, San Francisco, California

1961 Detroit Business Show
- Date: May 2-4, 1961
- Place: Detroit, Michigan (Cobo Hall)
- Information: The Detroit Business Show, 817 Penobscot Building, Detroit 26, Michigan

Western Joint Computer Conference
- Date: May 9-11, 1961
- Place: Los Angeles, California (Ambassador Hotel)

NOMA International Conference and Office Exposition
- Date: May 7-11, 1961
- Place: St. Louis, Missouri (Sheraton-Jefferson Hotel and Kiel Auditorium)
- W. H. Latham, National Office Management Association, Willow Grove, Pennsylvania

AIIE Annual Conference
- Date: May 11, 12, 1961
- Place: Detroit, Michigan (Sheraton-Cadillac Hotel)
- Information: A. Patrick, Program Chairman, 28093 Wildwood Trail, Farmington, Michigan

ORSA National Meeting
- Date: May 25, 26, 1961
- Place: Chicago, Illinois (Sheraton Blackstone Hotel)
- Information: Dr. Donald H. Schiller, Caywood-Schiller Associates, 203 North Wabash Avenue, Chicago 1, Illinois

NMAA National Conference
Date: June 28-30, 1961
Place: Toronto, Canada (Royal York Hotel)
Information: R. Calvin Elliott, Executive Director, National Machine Accountants Association, 1750 West Central Road, Mt. Prospect, Illinois

8th Annual International Meeting of The Institute of Management Sciences
Date: August 23-26, 1961
Place: Brussels, Belgium (Palace of Congresses)
Information: TIMS, Box 273, Pleasantville, New York

Association for Computing Machinery National Conference
Date: September 6-8, 1961
Place: Los Angeles, California (Statler-Hilton Hotel)
Information: A. C. M. 1961 National Conference, P. O. Box 1437, Santa Monica, California

NABAC National Convention (The Association for Bank Audit, Control, and Operation)
Date: September 11-13, 1961
Place: Chicago, Illinois
Information: NABAC, 38 South Dearborn Sreet, Chicago 3, Illinois

International Systems Meeting
Date: October 8-11, 1961
Place: Cleveland, Ohio (Hotel Statler and Hotel Pick-Carter)
Program: "Systems Management in Transition"
Information: Systems and Procedures Association, 817 Penobscot Building, Detroit 26, Michigan

Computer Applications Symposium, sponsored by Armour Research Foundation
Date: October 24, 25, 1961
Place: Chicago, Illinois (Terrace Casino, Morrison Hotel)
Information: Robert B. Brausch, Armour Research Foundation, 10 West 35th Street, Chicago 16, Illinois

Institute on Electronics in Management, sponsored by The American University
Date: October 30--November 3, 1961
Place: The American University, Washington, D. C.
Information: Prof. Lowell H. Hattery, Director, Center for Technology and Administration, The American University, 1901 F Street, N. W., Washington 6, D. C.

TIMS-ORSA 2nd National Meeting
Date: November 8-11, 1961
Place: San Francisco, California (Jack Tar Hotel)
Information: The Institute of Management Sciences, Box 273, Pleasantville, N. Y.

References

DATA PROCESSING DIGEST does not provide copies of the original material digested or reviewed in this issue. The publishers' addresses are listed below for your convenience in writing to them for more complete information.

Banking
12 East 36th Street
New York 16, New York

Business Week
330 West 42nd Street
New York 36, New York

The Controller
Two Park Avenue
New York 16, New York

Data Processing
Gille Associates
22nd Floor, Book Tower
Detroit 26, Michigan

Datamation
10373 West Pico Blvd.
Los Angeles 64, California

Engineering News-Record
330 West 42nd Street
New York 36, New York

Harvard Business Review
Soldiers Field Station
Boston 63, Mass.

Management & Business Automation
600 West Jackson Blvd.
Chicago 6, Illinois

Pergamon Press Inc.
122 East 55th Street
New York 22, New York

The Practical Lawyer
American Law Institute
133 South 36th Street
Philadelphia 4, Pennsylvania

Purchasing
205 East 42nd Street
New York 17, New York

Railway Age
30 Church Street
New York 7, New York

John Wiley & Sons, Inc.
440 Fourth Avenue
New York 16, New York

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